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LOCALIZED STUDIES IN SHELTER BELT TREE GROWING BY ACADEMY OF SCIENCES USSR EXPEDITION

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In connection with the Stalin Plan for the Transformation of Nature made public in the party and state decree of 20 October 1948, on 24 July 1949 the Council of Ministers decreed that the Academy of Sciences USSR organize a large joint expedition to study shelter belt tree-growing problems. The expedition faced the following tasks:

1. To develop new and more advanced methods of planting and cultivating state shelter belts, kolkhoz and sovkhoz field shelter belts, as well as industrially important oak forests in the steppe and forest steppe zones of the USSR.

2. To develop and perfect forest management methods for the state shelter belts.

3. To study natural conditions on the state shelter belt routes and in the planned oak forest areas in order to be able to advise the ministries and local organizations in regard to land on which state shelter belts and oak forests are to be planted, planting projects, establishment of tree nurseries, and seed procurement.

General supervision of the expedition was vested in V. N. Sukachev.

Two detachments, northern and southern, were organized to carry out the first two tasks. The northern detachment was to work in a chernozem zone, the southern in a chestnut-solonets and brown soil zone.

The detachments faced two main tasks:

1. To develop basic scientific principles of steppe shelter belt tree growing by studying the effect of shelter belts existing in association with other elements of the grass field system of agriculture on changes in natural conditions (climatic, soil, hydrologic, and other) and on increased agricultural productiveness in the territory influenced by the belts.

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2. To develop scientific principles for applying measures (conservation, forestry, and others) which have as their objective the improvement of tree-growing conditions by studying the effect of natural and man-made factors on the growth of shelter belts and by conducting special experiments.

The Stalin Plan for the Transformation of Nature contemplates changing not one or two but all of the most important elements of nature. For that reason, scientific-research work must not only embrace all these elements, but must also embrace them in their interrelationships, which calls for extremely complex research work. Taking part in this research there must be foresters, geobotanists, soil scientists, geomorphologists, hydrogeologists, hydrologists, climatologists, zoologists, microbiologists, and agronomists.

All research must be based on the theories of V. V. Dokuchayev on the interaction of all natural factors among themselves, and on the basic propositions of V. R. Vil'yams on the role of the biological factor in the formation and evolution of the physicogeographical habitat and the role of man in its alteration.

The tasks facing the detachments must be accomplished by means of a twofold course of action.

The first of these is a study of existing timber stands (belt or forest) to be carried out according to the expedition method. In making this study, primary attention must be directed toward a clarification of the effect of the timber stand on the adjoining agricultural areas and toward a clarification of the growing qualities of the trees in relation to surrounding natural conditions and forest management methods.

The following program of studies was established:

1. A general geomorphological, geological, and soil study of the region where a particular stand is located.

2. A detailed study of the soils under the stand and at varying distances from it.

3. A study of the soil moisture profile for the purpose of ascertaining the effect of the stand on changes in moisture supply.

4. A study of the depth of occurrence of ground water and of any changes in it which may occur under the influence of the stand.

5. A study of soil-erosion phenomena and the effect of the stand on them.

6. A floral and geobotanical study for the purpose of ascertaining the interrelationships which exist between trees and grassy vegetation.

7. A study of the rate of growth and development of the stand in relation to natural conditions and planting and management practice in the stand.

8. A general ecological faunal study of the stand and surrounding territory, with special emphasis on the identification of animals useful and harmful to trees and to agriculture, for the purpose of introducing measures to reconstitute the animal population and direct it in the right direction.

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9. An agronomic study for the purpose of establishing the influence of forest stands, as well as of other elements of the grass field system, on productiveness of agricultural land.

Analysis of the data obtained from these studies will permit forecasting those changes which can be expected to take place in the soils under forest stands and the rate of growth and development which can be expected in newly planted forests. Analysis of the data will also permit estimates of agricultural, soil improvement, and other measures required to establish shelter belts, of the species which must be planted, and of the measures which must be undertaken to protect the belts from pests.

However, many phenomena which vary over a period of time cannot be studied during the time allotted the expedition for study of timber stands. These phenomena include water supply in the broad sense, nutrient supply, climatic phenomena, etc. To study the relationship of these phenomena to the establishment of shelter belts and other elements of the grass field system of agriculture localized studies must be organized. The organization of localized studies is the second course of action to be undertaken in accomplishing the above-stated tasks.

Both existing and newly planted timber stands must be used for the localized studies.

Since the planting of shelter belts, as well as most of the other measures, is primarily intended as a means to effect a change in the water supply of an area, it is necessary to choose an area for local observations where it will be possible to compute the total water supply of that area (composed of atmospheric precipitation, all forms of flowing water, ground water, evaporation, etc.). A water-collecting basin several thousand hectares in size will be satisfactory. Hydrological water measuring stations, runoff areas, soil observation areas, experimental plots, etc must be distributed in the basin.

The following must be present, as far as possible, on the local observation area:

1. A segment of a state shelter belt.

2. An agricultural area on which a system of kolkhoz shelter belts will be created and the other elements of the grass field system established.

3. An existing mature timber stand (forest or shelter belt).

4. Constantly flowing water.

The area chosen must be subjected to a careful and comprehensive preliminary study for the purpose of establishing the initial state of the area. Then when future comparisons are made with the initial state, it will be possible to compute changes resulting from the establishment of the grass field system. At the same time, the initial state data will serve as a basis for further observations.

The research work corresponding to the two main tasks mentioned above must follow two lines of direction which are closely related to each other.

The first of these lines of direction consists of initiating experiments in the following: tree-planting and cultivating methods; soil-improvement measures (particularly for solonets soils); tree species selection; planting of seeds having varying geographical origins; tree spacing;

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and make-up and layout of shelter belts. All of these experiments must be accompanied by observations of the growth rates of various species under varying natural conditions, by observations of the interactions taking place between trees and grassy vegetation, by observations of the appearance of fauna in the belts, etc.

The second line of direction, closely related to the former, consists of making observations of the influence of shelter belts on the whole complex of natural and economic conditions.

Observations to be made include:

1. Changes in climatic conditions throughout the area under the influence of the entire complex of measures entering into the grass field system of agriculture and changes in microclimatic conditions in the shelter belts and areas between belts.

2. Changes in the water supply and water balance of the entire area, e.g., snow cover and its redistribution; freezing and thawing of soils; water supply and water balance of soils; heat supply and heat balance of soils; surface runoff; flow, supply, and balance of ground water; channel flow.

3. Changes appearing in water erosion, washing, and wind erosion and in wind-blown and water-borne accumulations.

4. Changes in phenological phenomena and structure (above and below ground) of the main vegetative groups, including shelter belt plantings and cultivated crops.

5. Changes developing in the structure and development root systems and in the photosynthesis and mineral feeding of the main cultivated and wild plants under the influence of shelter belts.

6. Faunal changes appearing in the areas between belts due to the influence of shelter belts; evidence that the belts are becoming breeding places for pests harmful to agricultural crops; methods of combating these pests.

7. Changes in productiveness of agricultural land as a result of the introduction of the grass field system of agriculture.

All of these observations must be made first of all in newly planted timber stands, to some extent in connection with the experiments listed above. But at the same time, these observations must be made in existing mature timber stands (both forests and belts) so that answers to practical questions concerning shelter belt tree growing may be obtained without delay. The results of observations made in existing timber stands will be basic in forecasting the appearance of similar phenomena in newly planted timber stands.

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